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APPENDIX B SUBSTITUTION SPECIFICATION - CLEAN VERSION

COARSE FREQUENCY SYNCHRONIZATION IN MULTICARRIER SYSTEMS

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FIELD OF THE INVENTION

The present invention relates to methods and apparatus for performing a coarse frequency synchronization compensating
10 for a carrier frequency deviation from an oscillator frequency in a demodulation system. In particular, the present invention relates to such methods and apparatus in a demodulation system for multi-carrier modulation signals, wherein the multi-carrier modulation (MCM) signals have a frame
15 structure comprising at least one useful symbol and a reference symbol.

The present invention is particularly useful in a MCM transmission system using an orthogonal frequency division multiplexing (OFDM) for digital broadcasting.
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BACKGROUND OF THE INVENTION

25 In a multi carrier transmission system (MCM, OFDM), the effect of a carrier frequency offset is substantially more considerable than in a single carrier transmission system. MCM is more sensitive to phase noise and frequency offset which occurs as amplitude distortion and inter carrier interference (ICI). The inter carrier interference has the effect
30 that the subcarriers are no longer orthogonal in relation to each other. Frequency offsets occur after power on or also later due to frequency deviation of the oscillators used for downconversion into baseband. Typical accuracies
35 for the frequency of a free running oscillator are about ± 50